Montana DEQ Research Findings - Customer Survey Findings

Prepared for:

Ben Brouwer
Energy Planning & Renewable Energy Section Supervisor,
Energy Bureau Montana Department of Environmental Quality
1520 E. 6th Avenue
Helena, MT 59601

Prepared by:

Dr. Katherine Johnson, President
Johnson Consulting Group
1033 Lindfield Drive
Frederick, MD 21702
Email: kjohnson@johnsonconsults.com

With

Ward Research

Revised Draft
December 19, 2019

Table of Contents

List of Figures

List of Tables

Executive Summary

The State of Montana has made significant progress in exploring ways to incorporate solar options into its overall energy policy. Specifically, the Montana Department of Environmental Quality (DEQ) has taken the lead in directing the State's efforts to assess solar options by leveraging the funding available from the U.S. Department of Energy's (DOE) SunShot Initiative.

Through this grant, the the Montana Energy Office (MEO) completed "a blueprint for how Montana communities can expand their access to community-scale solar energy developments."

This report summarizes the findings from 168 residential customers and 164 small commercial customers in Montana. The objective of this survey was to assess the overall level of customer interest in community solar projects with NorthWestern Energy and Montana-Dakota Utility (MDU) customers.

The questionnaires were constructed to explore the following hypotheses, modeled after a similar study conducted in Texas.

- Hypothesis 1. Solar energy (a) attitude, (b) subjective norms, and (c) Perceived Behavior Control (PBC)[1] will predict intentions to consider participating in a community-scale solar project.
- Hypothesis 2. Solar energy (a) attitude, (b) subjective norms, and (c) PBC will predict intentions to contact the sponsoring utility for more information.

Overall, these surveys found strong linkages between customer attitudes, norms, and perceived customer intentions. Specifically, we found that customers were interested in learning more about community solar projects.

Other key findings from these customer surveys revealed:

- *While customers may not be familiar with solar PV technologies, they are interested in participating in a community solar project.* The most interested residential customers are:
  - Live in multifamily homes;
  - Customers with a graduate degree;
  - Did not have a specific preference regarding the location of solar project; and,
  - Were willing to pay $40.00 or more per month to participate in a community solar project.
- *There were no significant differences among the commercial customers to identify any particular target groups.* Overall, these customers are interested in participating in a community solar project; however, they are unfamiliar with specific details about these projects.

[1] PBC is defined as a perceived behavioral control or perception to perform that action

- *The respondents indicated differing opinions around the topic of climate change among both residential and commercial customers.*
- *The high up-front cost of solar PV remains the largest barrier to customers purchasing their own solar PV system*. Furthermore, customers who did not own a solar PV system did not believe that investing in type of system was either practical or feasible for their current home or business.
- *Overall, customers expected that participation in a community solar project would reduce their bills substantially*. Customers estimated the monthly change they would expect from a community solar project--that is would participation in a community solar project either increase or decrease their monthly energy bill. The customers then provided estimates by how much they believed their monthly energy bill would change.

- On average, residential customers estimated that participation in a community solar project would lower their monthly bill by as much as $53.46 while commercial customers projected an even higher savings of $94.19

Key Recommendations

The following recommendations are based on the customer survey findings.

- *Community solar projects could be located within the state of Montana,* as none of the customer groups expressed a strong interest in having a community solar project located in a specific city, community or within Montana.
- *Community solar projects would be favorably received among both commercial and residential customers.* However, customer expectations regarding anticipated monthly savings should be clarified to minimize any potential customer confusion or negative feedback.

1. Introduction

The State of Montana has made significant progress in exploring ways to incorporate solar options into its electricity supply mix. Specifically, the Montana Department of Environmental Quality (DEQ) has taken the lead in directing the State's efforts to assess solar options by leveraging the funding available from the U.S. Department of Energy's (DOE) SunShot Initiative. Through this grant, the Montana Energy Office (MEO) conducted outreach to communities across the state, completed "a blueprint for how Montana communities can expand their access to community-scale solar energy developments, and supported feasibility studies and project development for innovative community-scale solar projects.

This report summarizes the findings of a survey of 168 residential customers and 164 small commercial customers in Montana. The objective of this survey was to assess the overall level of customer interest in community solar projects with NorthWestern Energy and Montana-Dakota Utility (MDU) customers.

2. Methodology

Johnson Consulting Group, and its partner, Ward Research, developed and fielded two customer surveys in early November 2019. The focus of this research initiative was to determine customer's attitudes and preferences regarding three key elements of community solar projects: interests, motivations and preferences.

Our questionnaires were constructed to explore the following hypotheses, modeled after a similar study conducted in Texas.

- Hypothesis 1. Solar energy (a) attitude, (b) subjective norms, and (c) Perceived Behavior Control (PBC)[2] will predict intentions to consider participating in a community-scale solar project.
- Hypothesis 2. Solar energy (a) attitude, (b) subjective norms, and (c) PBC will predict intentions to contact the sponsoring utility for more information.

These hypotheses were then explored in the following research objectives, summarized in Table 1.

[2] PBC is defined as a perceived behavioral control or perception to perform that action

Table 1: Summary of Key Research Objectives – Residential Customer Surveys

Research Area	Key Research Questions
Customer Awareness	Are customers aware of the solar technologies? Are customers aware of community – scale solar projects? If so, how did they learn about them?
Customer Attitudes	How do these customers view community-scale solar projects? What do they think others think their family/friends/ work colleagues think of community-scale solar projects? How important is it to rely on solar energy for electric usage?
Customer Interests	How important is using renewable technologies to the customer? How important are renewable technologies to your community?
Previous Experience (Motivations)	What types of experiences have customers had with solar PV technologies? What has been their assessment? What do they like? What don't they like?
Barriers to Community Solar Participation	How are the major barriers to preventing them from participating in community solar projects? Are the costs too high? Are contractors available? Is the offering well understood?
Willingness to Pay (Preferences)	What financing options are most attractive to customers by class? What financing offerings are they familiar with: on-bill, solar leasing, community gardens, contractor financing, conventional loans? What is the ideal monthly cost for a subscription-based program? What is the ideal monthly cost for a solar lease?
Key Customer Demographics	What is the customer breakdown within small commercial groups? What is the average household income among the residential customers? How many own homes/vs. rent; how many own buildings vs; lease?

3. Residential Survey Findings

RESIDENTIAL

This section summarizes the key findings from this residential customer survey. The findings are organized by topic area. Significantly significant findings are also highlighted as appropriate.

3a. Awareness

First, residential customers answered several questions regarding their overall awareness of solar technologies, solar financing programs and the ways in which they learned about solar programs.

Overall, 92 percent of these residential customers were aware of solar technologies. This awareness was spilt evenly among customers from Montana-Dakota Utilities and NorthWestern Energy as Figure 1 shows.

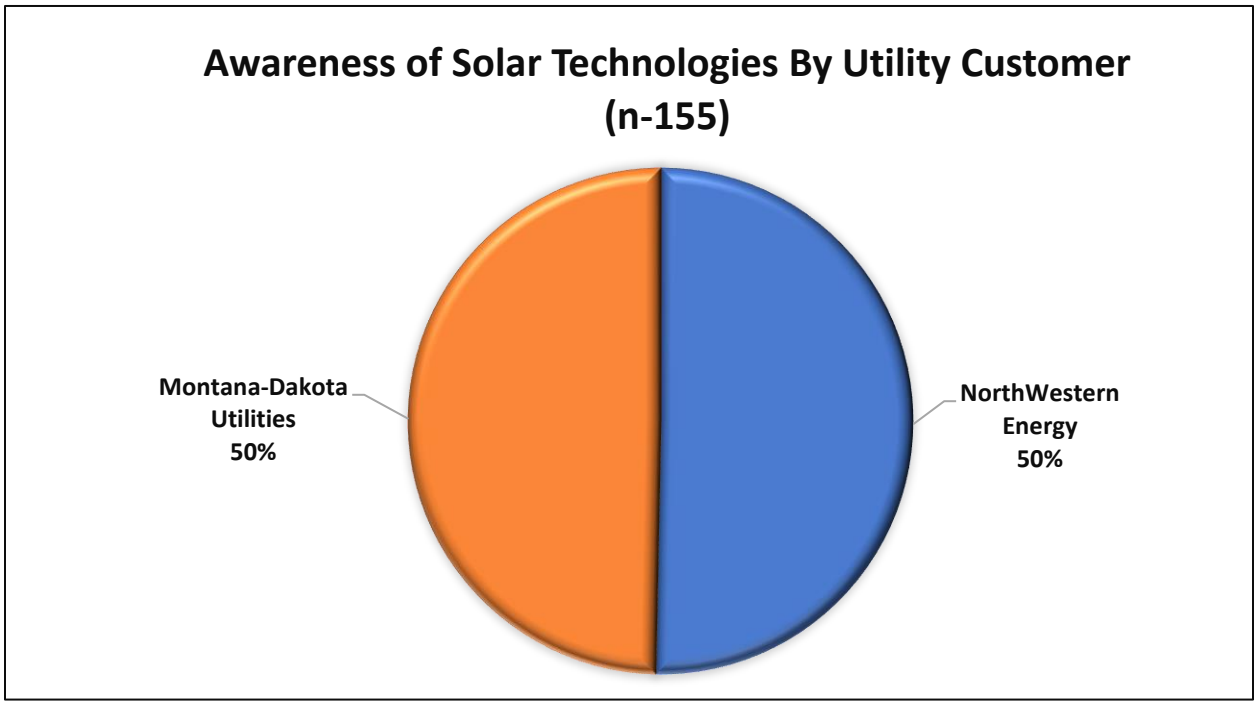

Figure 1: Awareness of Solar Technologies by Utility Customer

Roof-top mounted solar PV installations were the most frequently mentioned technology by these participants (99%) followed by other types of solar applications, summarized in Table 2.

Table 2: Types of Solar Technologies Mentioned* by Residential Customers

Awareness of Solar Technologies	Number Mentioning	% Mentioned
Solar PV mounted on a roof	153	99%
Solar PV on ground	129	83%
Large, multi-acre ground mounted solar PV	128	83%
Solar water/air heating systems	95	61%
Solar power using mirrors to generate steam	4	3%
Vehicles	3	2%
Wind Power	3	2%
Other	12	7%
Total	**527**	**100%**

*Multiple response question

But only one-third (30%) of the respondents could recall the ways in which they learned about solar technologies. These respondents mentioned learning about these technologies from a variety of sources including: news stories (18%) and seeing them installed in their local area (15%), as Figure 2 illustrates.

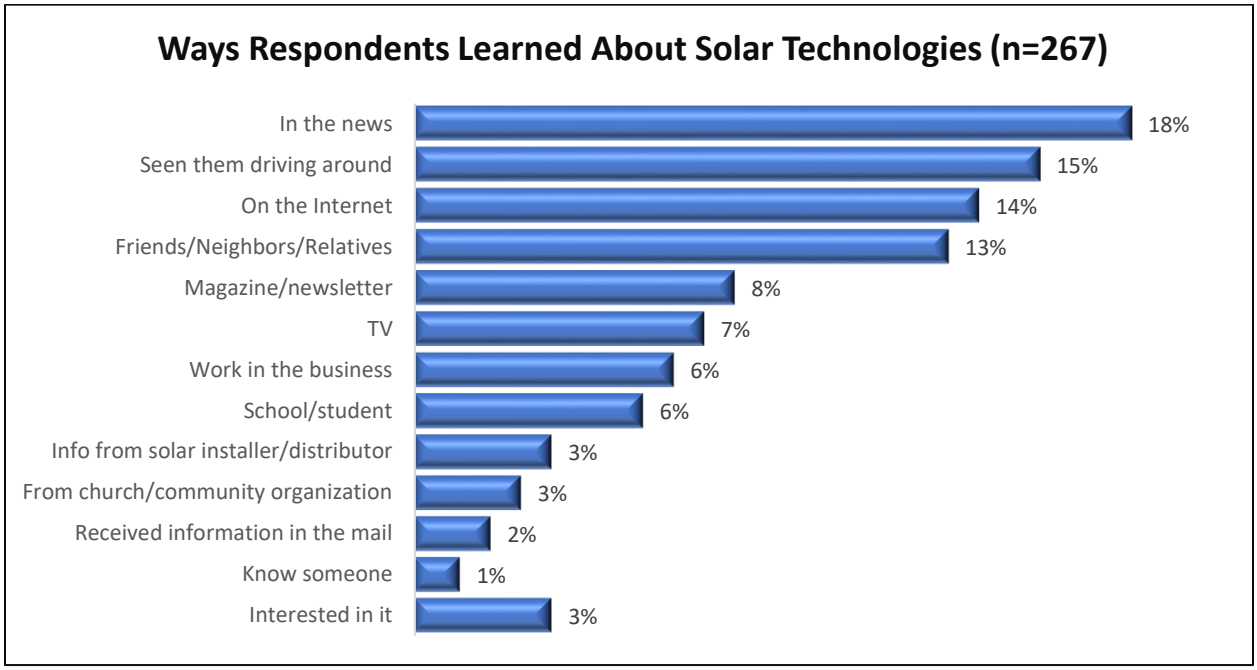

Figure 2: Ways Respondents Learned About Solar Technologies

3a.1 Awareness of Community Solar Programs

While customers may be aware of solar technologies in general, they are not aware of any specific community solar projects as Table 3 shows. For example, only 41 percent of these customers mentioned shared solar programs while one-third (36%) were aware of community solar PV projects while slightly more than a quarter referred to green tariff programs (29%). Only 14 percent mentioned community solar gardens.

Table 3: Types of Community Solar Projects Mentioned

Awareness of any Community Solar PV Projects	Number of Responses	% of Total
Shared solar programs managed by electric utility/co-op	54	32%
Green tariff or renewable energy buying programs	44	26%
Community solar gardens	21	13%
I've seen it around	7	4%
Something else	7	4%
Don't Know	69	41%

But, of interest, those customers who knew about shared solar programs, were also significantly more likely to indicate a preference for a location of a community solar project.

3b. Customer Attitudes Regarding Solar Programs

These residential customers rated their level of agreement on a five-point scale for a series of questions measure their overall interest, motivations, and intentions (preferences) regarding solar PV technologies. On this five-point scale, "1" meant "Strongly Disagree" and "5" meant "Strongly Agree. The overall findings are provided next, followed by a more detailed analysis for each specific question set.

Figure 3 summarizes the findings for those questions that had the highest number of "Strongly Agrees," or a rating of "5". As this figure shows, these customers agreed most strongly with statements regarding being "proactive" about their energy source, concern about climate change, and that participating in a community solar project would reduce environmental impacts. Nearly one-third of all residential customers rated each of these statements a "5."

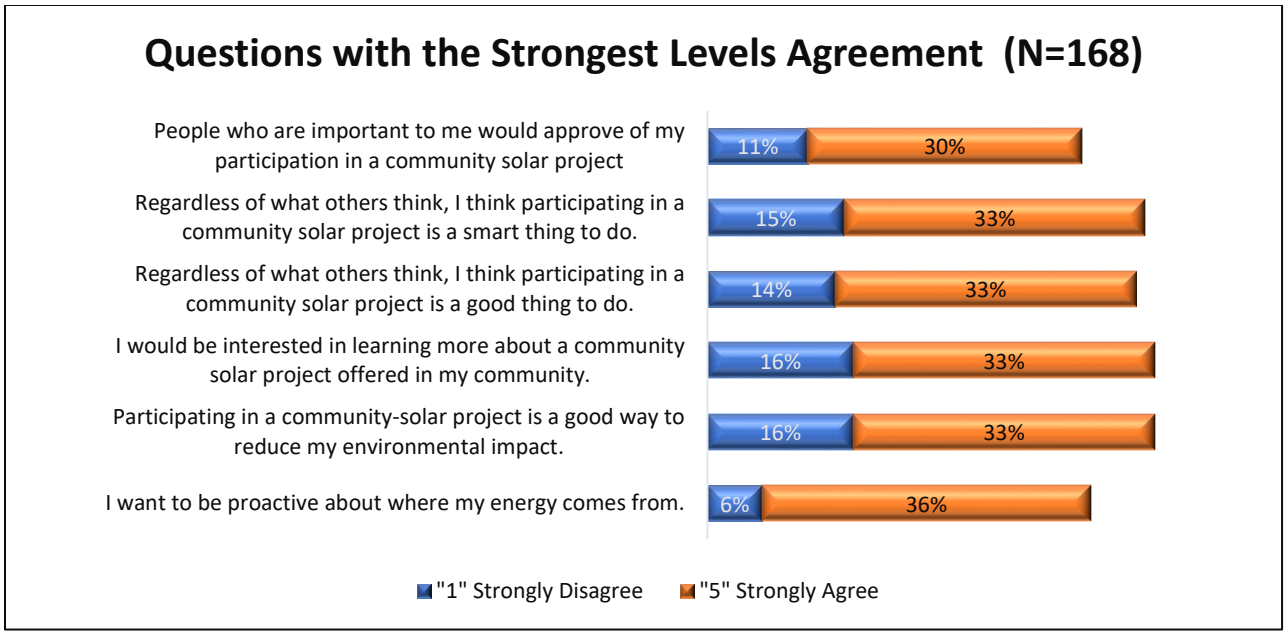

Figure 3: Questions with the Highest Level of Agreement

Figure 4 summarizes the results for the negative questions and identifies those questions in which the customers expressed the highest level of disagreement. However, this result is expected as some of these questions were designed to elicit negative rather than positive responses.

Not surprisingly, most respondents had not heard about community solar projects from their friends (67%), electric utilities or co-ops (42%) or from other states (40%). The respondents also expressed strong levels of disagreement regarding the benefits of the community solar (39%) or the reliability of community solar power (36%).

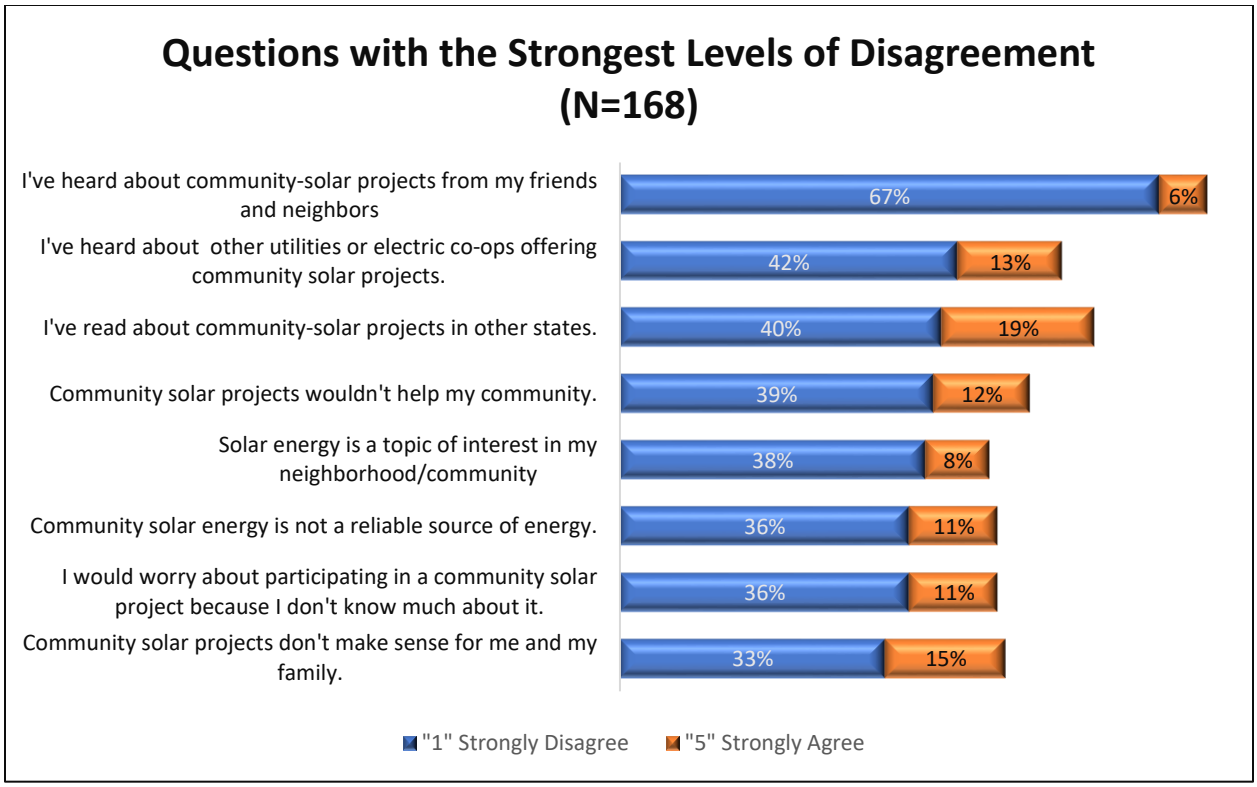

Figure 4: Questions with the Highest Level of Disagreement

Figure 5 illustrates those questions in which the respondents were nearly evenly split between either “Strongly Agreeing” or “Strongly Disagreeing” with the statement. As this figure shows, some of this division could be due to a lack of familiarity with community solar projects as well difference opinions about climate change. These findings suggest that messages that reference climate change could be counter-productive to promoting a community solar project.

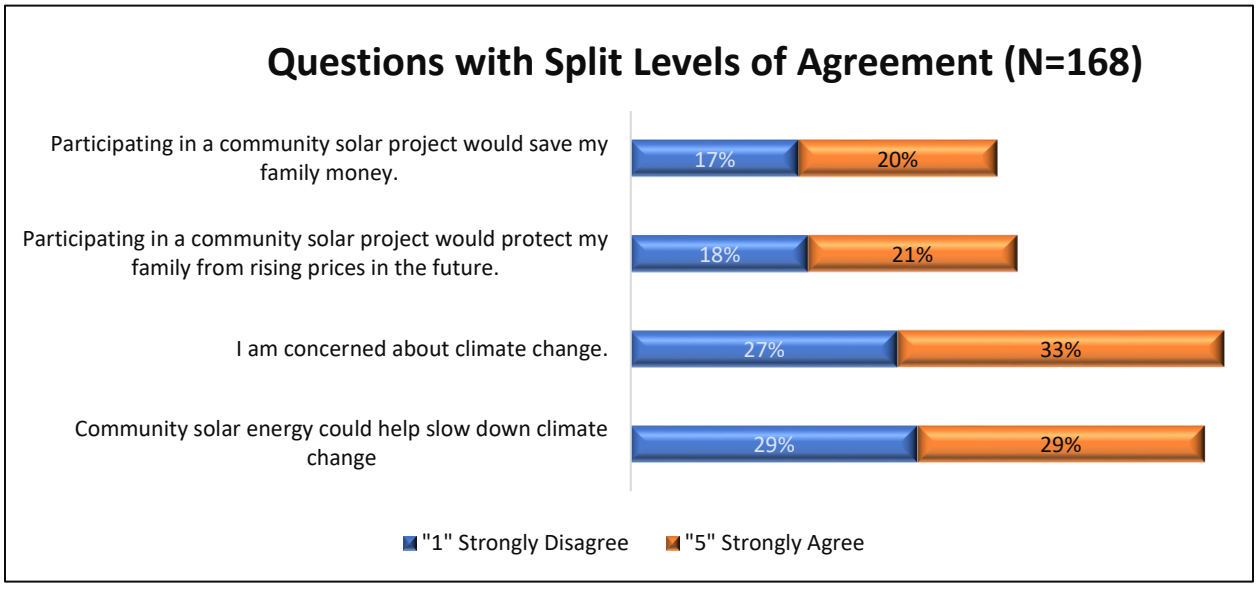

Figure 5: Questions with the Split Level of Agreement

3b.1 Attitudinal Questions

The respondents answered six questions about their general attitudes about solar projects using a five-point scale where "1" meant "Strongly Disagree," and "5" meant "Strongly Agree." As Figure 6 shows, most of these customers provided average ratings between 3.72 to 2.29, suggesting either no strong opinion "i.e., a rating of 3" or mild disagreement (i.e., a rating of "2"). One statement generated the highest levels of agreement, *"I want to be proactive about where my energy comes from,* (average rating of 3.72) on a five-point scale. However, these respondents also indicated some mild level of disagreement about the benefits of community solar projects, providing average ratings of less than 3.0. These findings suggest that respondents do not have any negative perceptions about community solar projects.

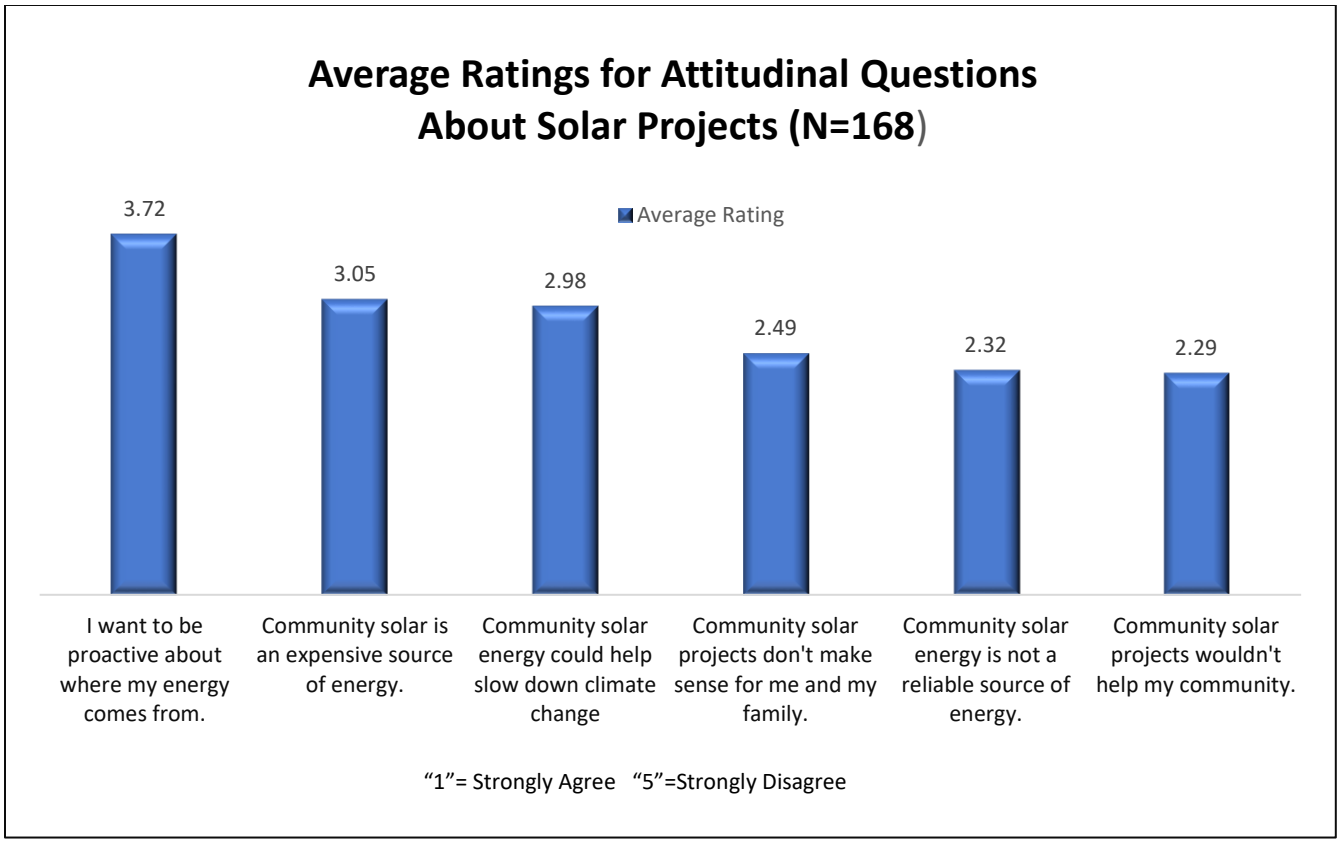

Figure 6: Average Ratings for Attitudinal Questions About Solar Projects

3b.2 Motivational Questions

Respondents also answered five questions designed to assess their motivations about participating in a community solar project using the same five-point scale, where a "1" meant "Strongly Disagree" and a "5" meant "Strongly Agree." Overall, these respondents did not express any strong opinions regarding these statements, with the average ratings of 3.09 and 3.52, which meant "Neither agree not disagree". Figure 7 summarizes these findings.

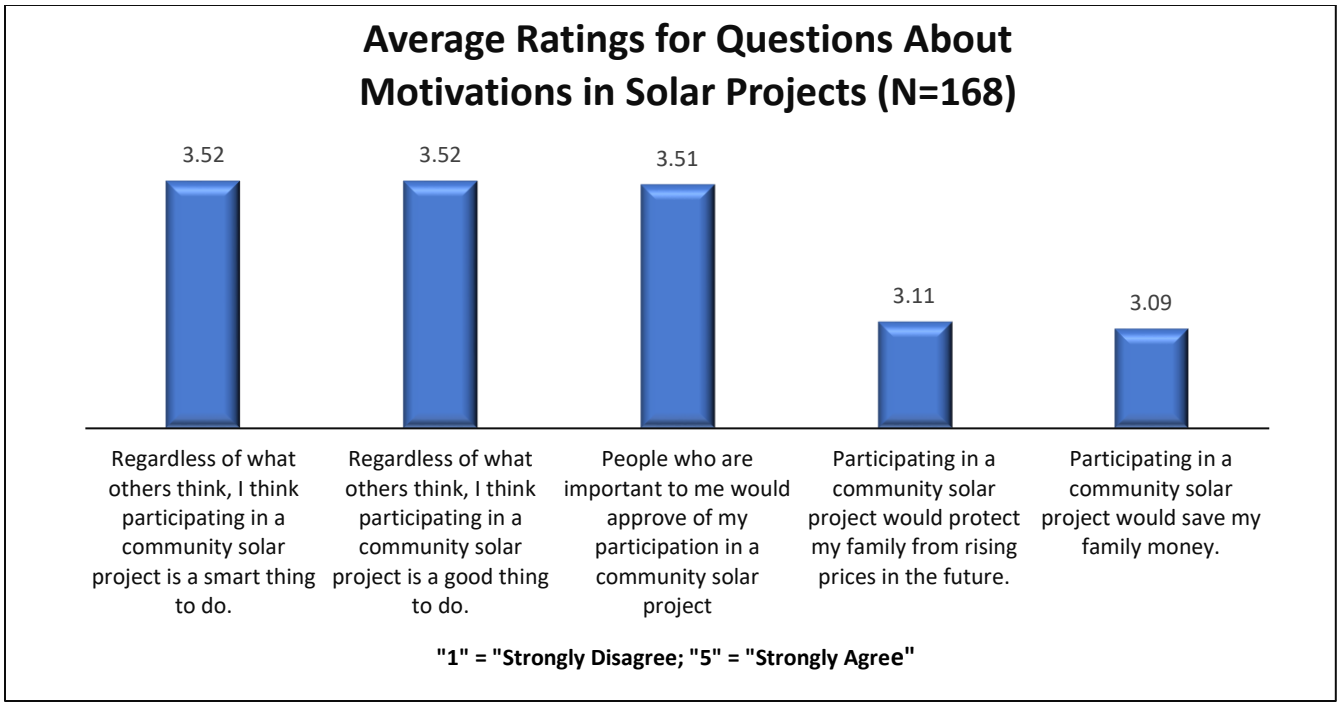

Figure 7: Average Ratings for Questions About Motivations in Solar Projects

These survey results also revealed several interesting linkages between customer groups for specific statements.

For example, respondents who strongly agreed (i.e., provided a rating of "5") with the statement*: "People who are important to me would approve my participation in a community solar project,"* were also:

- Significantly more likely to be willing to pay $40.00 or more per month to participate in a community solar project (43%) compared to those who would pay less than $40.00 per month (40%).

3b.3 Interest Questions

The residential customers also reported their level of agreement with nine questions designed to assess their interest level in participating in a community solar project. The levels of agreement fluctuated which may be driven by the respondents' awareness of community solar projects. Figure 8 summarizes the average ratings for the following questions:

a. *Participating in a community-solar project is a good way to reduce my environmental impact.*
b. *I would be interested in learning more about a community solar project offered in my community.*
c. *Community solar makes sense because I could get solar power without putting panels on my roof.*
d. *I am concerned about climate change.*
e. *I've read about community-solar projects in other states.*
f. *I would worry about participating in a community solar project because I don't know much about it.*
g *I've heard about other utilities or electric co-ops offering community solar projects.*
h. *Solar energy is a topic of interest in my neighborhood/community.*
i. *I've heard about community-solar projects from my friends and neighbors*

Given the length of these questions, they are abbreviated in the Figure 8.

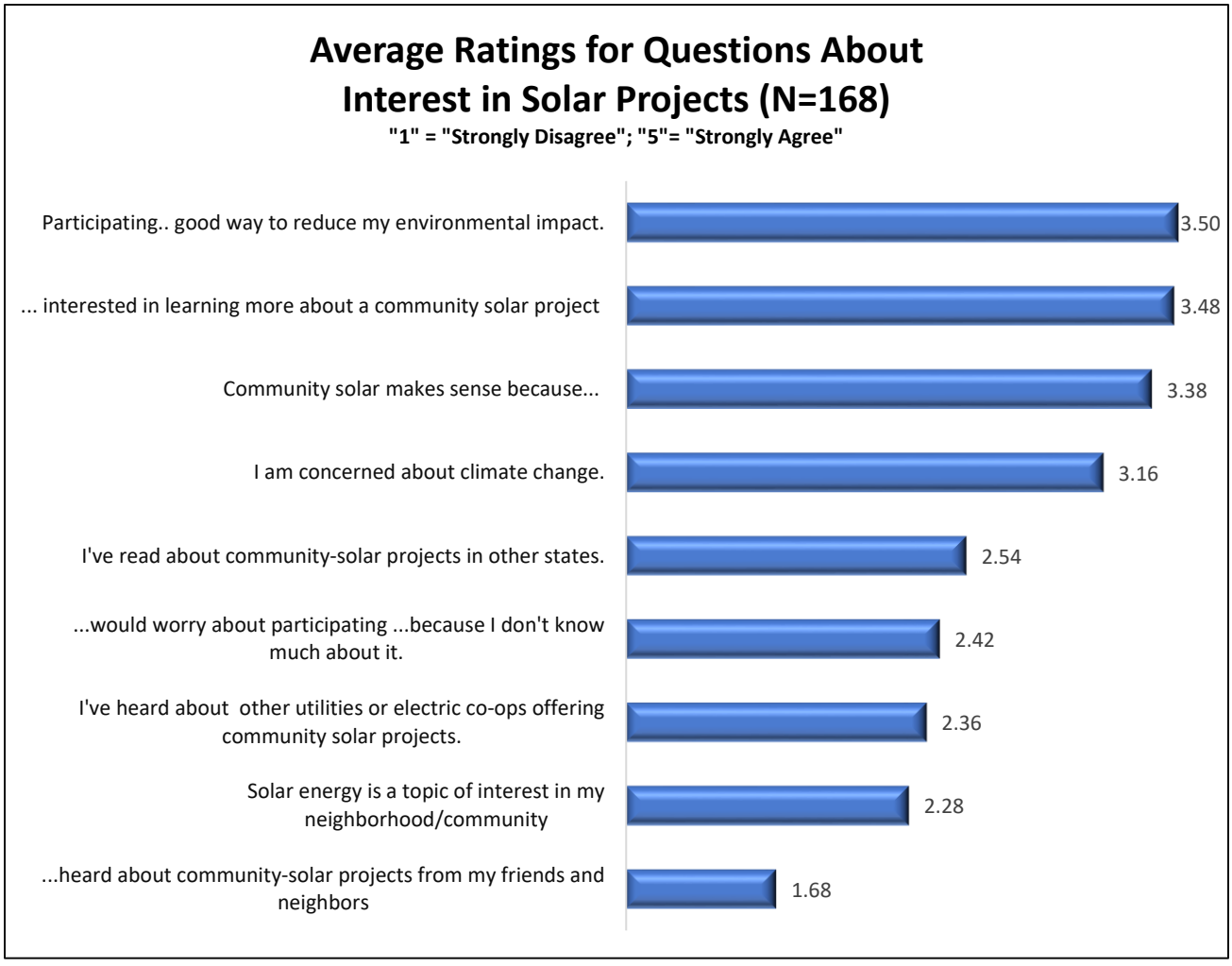

Figure 8: Average Ratings for Questions About Interest in Solar Projects

However, several statements generated statistically significant responses within customer groups. For example, respondents who strongly agreed with the statement, "*Participating in a community solar project is a good way to reduce my environmental impact:"*

- Were also significantly more likely to be interested in a community solar project (78%), compared to those who were not interested (19%);
- NorthWestern Energy customers had statistically significantly higher levels of agreement with this statement compare to MDU customers (average scores of 3.78 compared to 3.22); and
- Customers who were willing to pay more than $40.00 per month to participate in a community solar project also reported significantly higher levels of agreement with this statement compared to customers who were willing to pay less than $40.00 per month (average scores of 3.92 vs. 3.52-$20-39.0 and 2.95 – less than $20.00 per month).

The statement, "*Participating in a community solar project would protect my family from rising prices in the future,"* uncovered several other notable differences among respondent groups such as:

- Those customers who did not have a location preference were significantly more likely to agree with this statement compared to customers who did have a location preference (4.0 vs 3.05, respectively); and
- Customers who are willing to pay $20.00 to $40.00 per month or more reported significantly stronger agreement levels compared to those customers who were willing to pay less than $20.00 per month or who "didn't know" (3.45 vs. 3.27 ($20-39.99) and 2.61 (less than $20.00 per month).

The negative statement "*Community solar projects don't make sense for me and my family,"* also revealed differences among utility customers. Specifically, MDU customers were significantly more likely to agree with this statement compared to NorthWestern Energy Utility customers (i.e., 2.71 vs. 2.27 average ratings, respectively).

The statement, "*Community solar makes sense because I could get solar power without putting panels on my roof,"* yielded the following insights:

- Customers with no location preference were significantly more likely to rate this statement a "5" compared to customers with a location preference (i.e., 32% vs. 18%);
- NorthWestern Energy customers reported significantly higher levels of agreement with this statement compared to MDU customers (i.e., average ratings of 3.67 compared to 3.11); and
- Customers who were willing to pay $40.00 or more per month to participate in a solar project were also significantly more likely to "Strongly Agree" with this statement compared to responses in other groups (i.e., average rating of 3.64 compared to average ratings of 3.40 ($20.00-$39.99) and 2.55 (less than $20.00 per month).

Regarding the statement, *"Community solar projects could slow down climate change,"* those customers who provided the highest level of agreement were also significantly more likely:

- To not have a location preference (3.19 mean rating) compared to those with a location preference (2.65 mean rating);
- To express an interest in participating in a solar project (3.51 average rating compared to 2.11 among customers who are not interested in participating);
- To expect that participating in a community solar project would reduce their electric bill every month (3.14 mean rating) or stay the same (3.26 mean rating) compared to those participants who expected participation in a community solar project would increase their monthly bill (2.07 average rating.)
- To be willing to pay $40.00 or more per month to participate in a community solar project (3.27 average rating) compared to who expect to pay less than $20.00 per month (2.65 average rating) to participate in a community solar project.

The customers who indicated the strongest levels of agreement with the statement*, "I would be interested in learning more about a community solar project offered in my community"* were also:

- Live in a multifamily home (4.19 average rating) compared to living in a single family home (3.36 mean rating) or a manufactured home (3.15 average rating); and
- Significantly more likely to have a graduate education (4.26 average rating) compared to having a college degree (3.44 average rating) or a high school diploma (3.22 average rating).

3c. Location Preferences

Another key aspect of this study was to identify if these respondents had any preferences regarding the location of a community solar project. As Figure 9 shows, two-thirds (62%) of these customers did not have a preference for a specific location for a community solar project (62%) compared to those who did (38%).

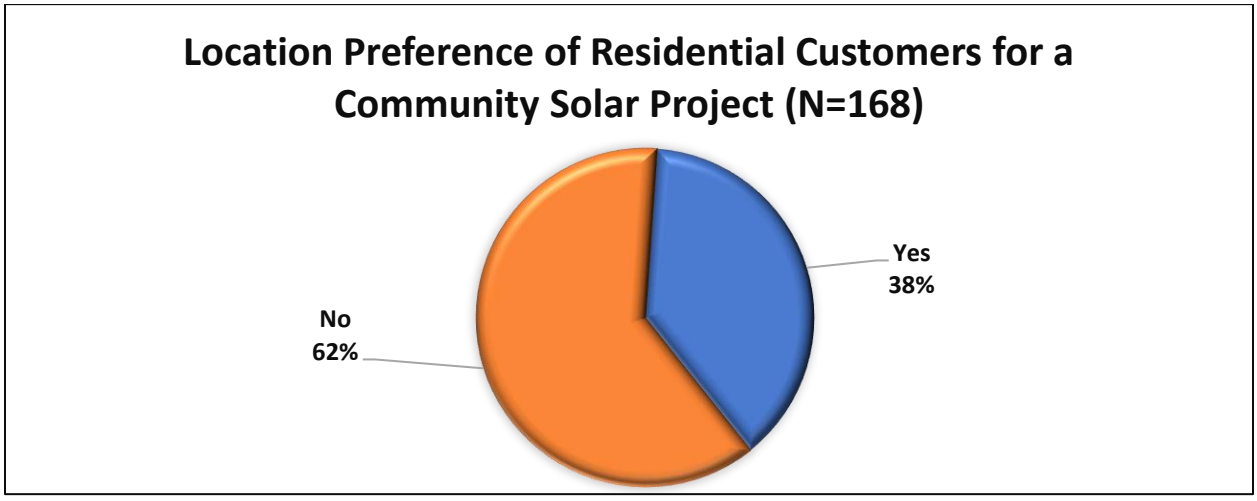

Figure 9: Location Preference of Residential Customers for a Community Solar Project

However, 63 customers who did express a preference regarding the location of a community solar project. The strongest preference was for the, community solar project to be located in the state of Montana (3.52 mean rating), but not in any specific city or community as Figure 10 illustrates.

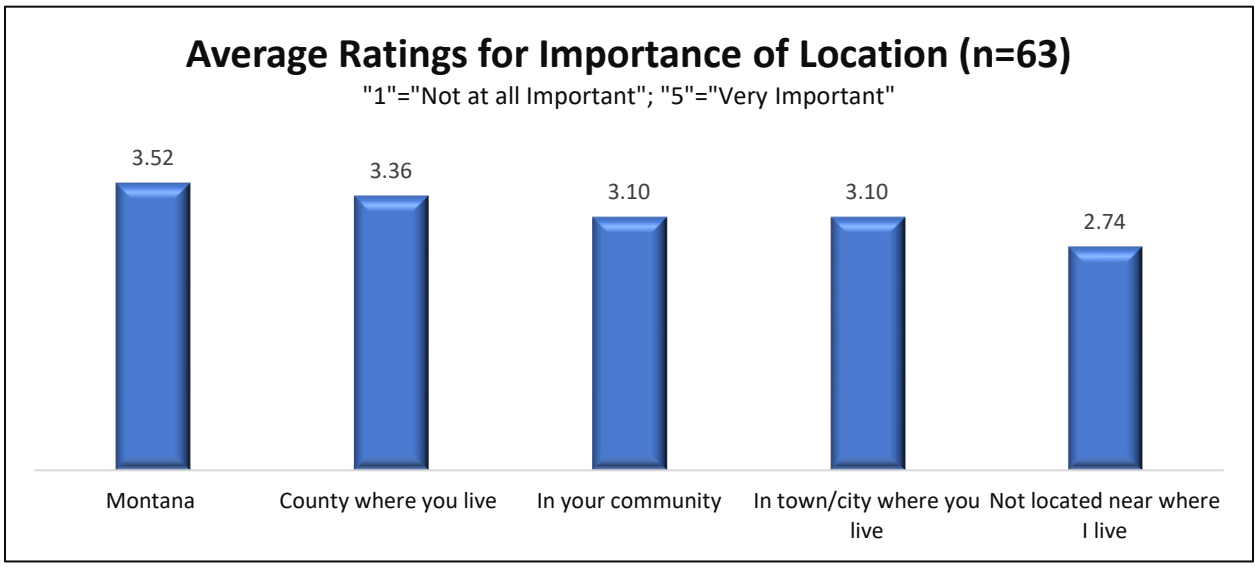

Figure 10: Average Ratings for Importance of Location

However, customer sentiment was actually more divided as one-third (30%) indicated a strong preference for locating a solar project in Montana while 32 percent indicated that they wanted a solar project "not located where I live."

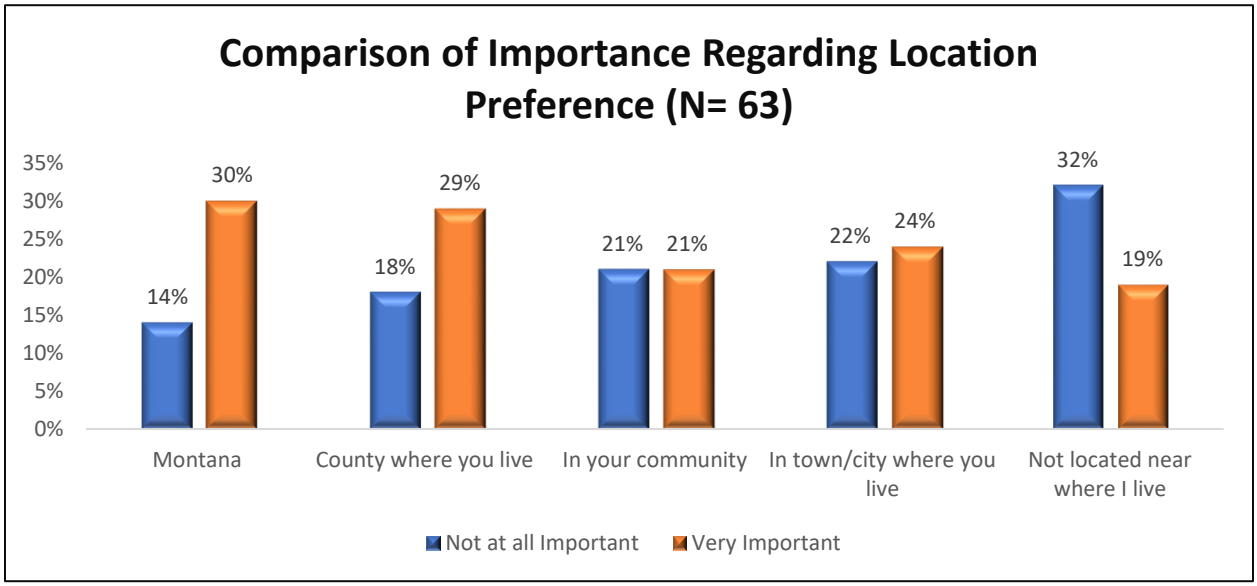

Figure 11: Comparison of Importance Ratings Regarding Location Preference

3d. Solar PV Ownership

Most survey respondents did not own a solar PV system (91%). Of the nine percent who did own a solar PV system, 15 had purchased their system within the past five years.

Of the respondents who owned a solar PV system, six are roof-top mounted systems while the remainder was another type of system.

Table 4 summarizes the reasons that these customers purchased a solar PV system. Most bought it to provide power in a remote location (21%) while four also mentioned that they hoped solar PV would be a cheaper option for providing electricity to their homes.

Table 4: Reasons for Purchasing a Solar PV System*

Reasons for Purchasing a Solar PV System	Number mentioned	% of Total (n=19)
I needed power in a remote location.	4	21%
I was hoping it would be cheaper	4	21%
To use alternative energy/save the planet	3	16%
To care for livestock/provide water/fences	2	11%
To live off the grid	2	11%
I am not entirely happy with how it works.	2	11%
It was already there.	1	5%
It is quiet and efficient.	1	5%

*Multiple Response Question

Those customers who had not purchased a solar PV system also answered a series of questions designed to assess their overall interest in making this type of investment. However, the majority (68%) had not considered purchasing a solar PV system while one-third (38%) had.

Table 5 summarizes the major barriers these customers identified to purchasing a solar PV system, financial barriers as the most commonly mentioned reasons such as the upfront cost (38%) and a poor return on investment (7%).

Table 5: Reasons for Not Purchasing a Solar PV System*

Reasons For Not Purchasing a Solar PV System	Number Mentioning	% of Total
Too expensive	32	38%
I don't own my own home	7	8%
Hard to find someone capable to install it	7	8%
Financing isn't available at a rate I can afford.	6	7%
The return on investment isn't worth it.	6	7%
I don't have a good place to put one in my home.	3	4%
Too little sun/snow/too cold	3	4%
Still building/renovating	3	4%
Other	17	20%
Total	**84**	**100%**

*Multiple Response Question

3e. Participation in a Community Solar Project

Overall, two-thirds of the survey respondents (61%) indicated that they were interested in participating in a community solar project, if offered, while one-third (33%) were not interested. (see Figure 12).

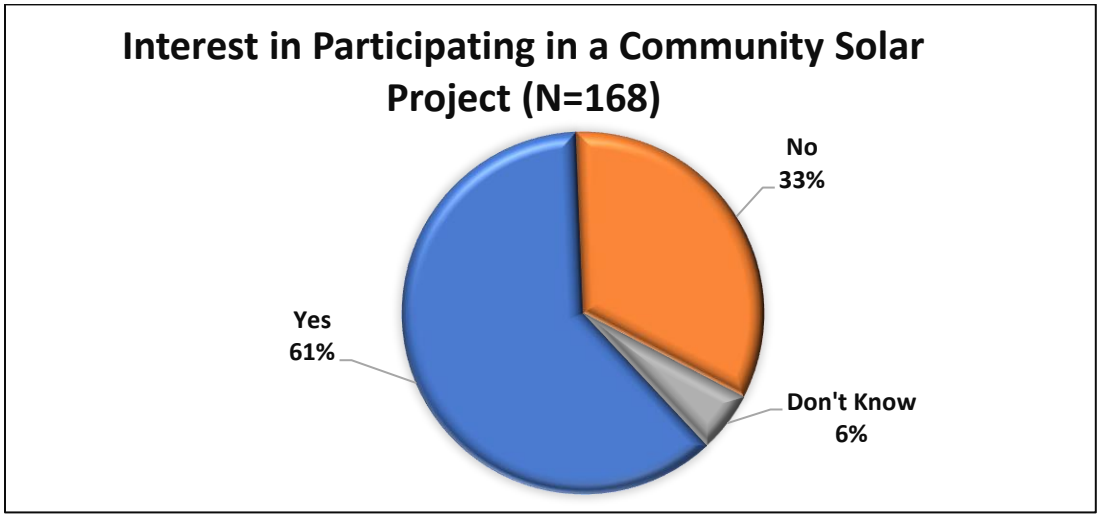

Figure 12: Interest in Participating in a Community Solar Project

As a follow the survey customers first indicated how they expected their electric bill to change by participating in a community solar program. Most (60%) expected their electric bill would be lower each month while 17 percent expected their electric bill to increase.

Table 6: If You Had the Option to Participate Would You Expect It To:

Expected Outcome	Number Responding	Percent of Total	Average Amount Bill Would Change
Lower your electric bill	101	60%	$53.46 decrease
Increase your electric bill	28	17%	$59.11 increase
Not change your electric bill	34	20%	
Don't know/Refused	5	3%	
Total	**168**	**100%**	

Of note, customers who were interested in participating in a community solar project were also significantly more likely to expect this project would lower their electric bill (i.e., 70% vs. 38%) compared to those who were not interested in participating in this type of project.

All of the respondents were then asked to provide a dollar estimate of how much they would expect that participation in a community solar project would change their electric bill. As Table 7 shows, on average, customers thought their bill will change by approximately $50.00. Specifically, customers either expected their monthly bill to *decrease* by $53.46 or to *increase* by $59.11.

3e.1. Willingness to Pay

All of the residential respondents indicated a wide range of the amounts they would be wiling to pay to participate in a community solar project. Of interest, 29 percent reported they would be willing to pay $50.00 or more per month to participate in a project, while 27 percent wanted to pay less than $20.00 per month to participate. One quarter (26%) were willing to pay between $20.00 to $39.99 per month, as Table 7 shows.

Table 7: Summary of Willingness to Pay Ranges Among Residential Customers

Ranges of Willingness to Pay	Number Reporting	% of Total
Less than $10.00	26	16%
$10.00-$19.99	18	11%
$20.00-29.99	29	17%
$30.00-$39.99	15	9%
$40.00-$49.99	24	14%
$50.00 or above	49	29%
Don't know	7	4%
Total	**165**	**100%**

3e.2 Familiarity with Solar Financing Options

Three-quarters of these respondents were familiar with monthly subscription from third-party providers (72%) and monthly lease options (71%) (see Figure 13).

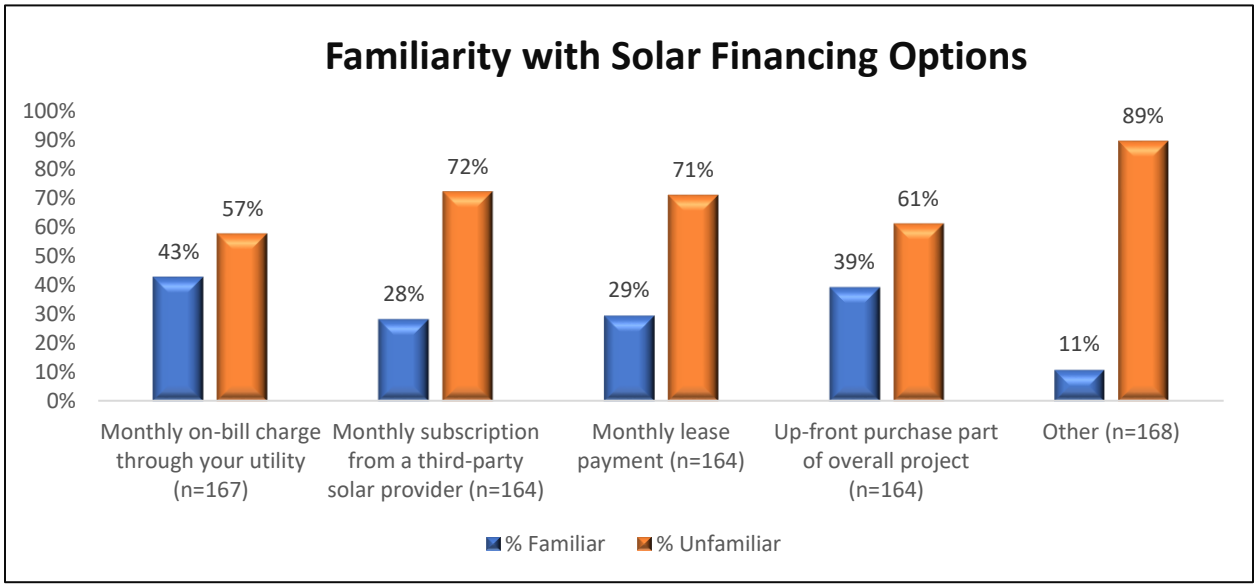

Figure 13: Familiarity with Solar Financing Options

Table 8 summarizes the types of financing options that these respondents expressed interest in, with the most frequently mentioned response was to have a monthly charge through the utility (25%).

Table 8: Summary of Interest in Solar Financing Options*

Which option would you like to find out more about?	Number Mentioning	% Mentioned
Monthly on-bill charge through your utility	76	25%
Up-front purchase as part of the overall community solar project	60	20%
Monthly subscription fee from a third-party provider	50	17%
Monthly lease payment	43	14%
None- I don't want to do solar	12	4%
Purchase outright	1	0%
Something Else	2	1%
Don't Know	56	19%
Total	**300**	**100%**

*Multiple Response Question

3f. Demographics

This survey also captured some key demographic information, which is summarized next. Of note, MDU respondents were significantly more likely to live in single family homes compared to NorthWestern Energy respondents (see Table 9).

Table 9: Distribution of Home Ownership Types

Type of Home	Total	Percent of Total
Single Family	128	76%
House with 2-4 units	14	8%
Multifamily with more than four units	13	8%
Manufactured home	13	8%
Total	**168**	**100%**

Three-quarters of these respondents owned their home (77%) while one-quarter (23%) were renters.

Most of these customers had received a college (34%) or graduate level education (11%) while the remainder had some college (30%) or a high school education (24%) as Table 1 shows.

Table 10: Distribution of Education Levels

Education Level	Number	% Mentioning
Some high school	5	3%
High School Graduate	36	21%
Some college/trade school	51	30%
College Graduate	57	34%
Graduate Education	19	11%
Total	**168**	**100%**

The majority of these customers earned between $30,000 to $75,000 annually (43%) while 30 percent earned more than $75,000 annually. Table 11 displays these findings.

Table 11: Distribution of Income Levels

Household Income	Number	% Mentioning
Less than $30,000	25	15%
$30,000 but under $50,000	40	24%
$50,000 but under $75,000	32	19%
$75,000 but under $100,000	20	12%
$100,000 or more	30	18%
Don't Know/Refused	21	13%
Total	**168**	**100%**

4. Commercial Survey Findings

We also conducted a survey of 164 small commercial customers during early November 2019. The notable findings from these survey responses are summarized next by topic area.

4a. Awareness of Solar Technologies

Nearly all of the commercial customers (92%) were aware of solar technologies while only eight percent were not. Of note, aware customers were also significantly more likely to have a preference location (97%) compared to those customers who did not have a locational preference (87%) (see Table 12).

Table 12: Types of Solar Technologies Mentioned by Commercial Customers*

Awareness of Solar Technologies	Number	% of Total
Solar PV mounted on a roof	151	27%
Large, multi-acre ground mounted solar PV	138	25%
Solar PV panels	126	23%
Solar water/air heating systems	102	19%
Other	33	6%

*Multiple Response Question

These commercial customers reported similar awareness levels of community solar projects, with "shared solar programs" mentioned by 26 percent of these customers. However, most commercial customers were not aware of any other type of community solar project (see Table 13).

Table 13: Types of Community Solar Projects Mentioned

Community Solar PV Projects	Number of Responses	% of Total
Shared solar programs managed by electric utility/co-op	52	26%
Green tariff or renewable energy buying programs	37	18%
Community solar gardens	24	12%
I've seen it around	5	2%
Something else	9	4%
Not heard of any of these	74	37%
Total	**201**	**100%**

The commercial customers also mentioned learning about these technologies in a variety of ways including "in the news" (18%) or driving in their community (14%). But overall, awareness levels of solar technologies are relatively low.

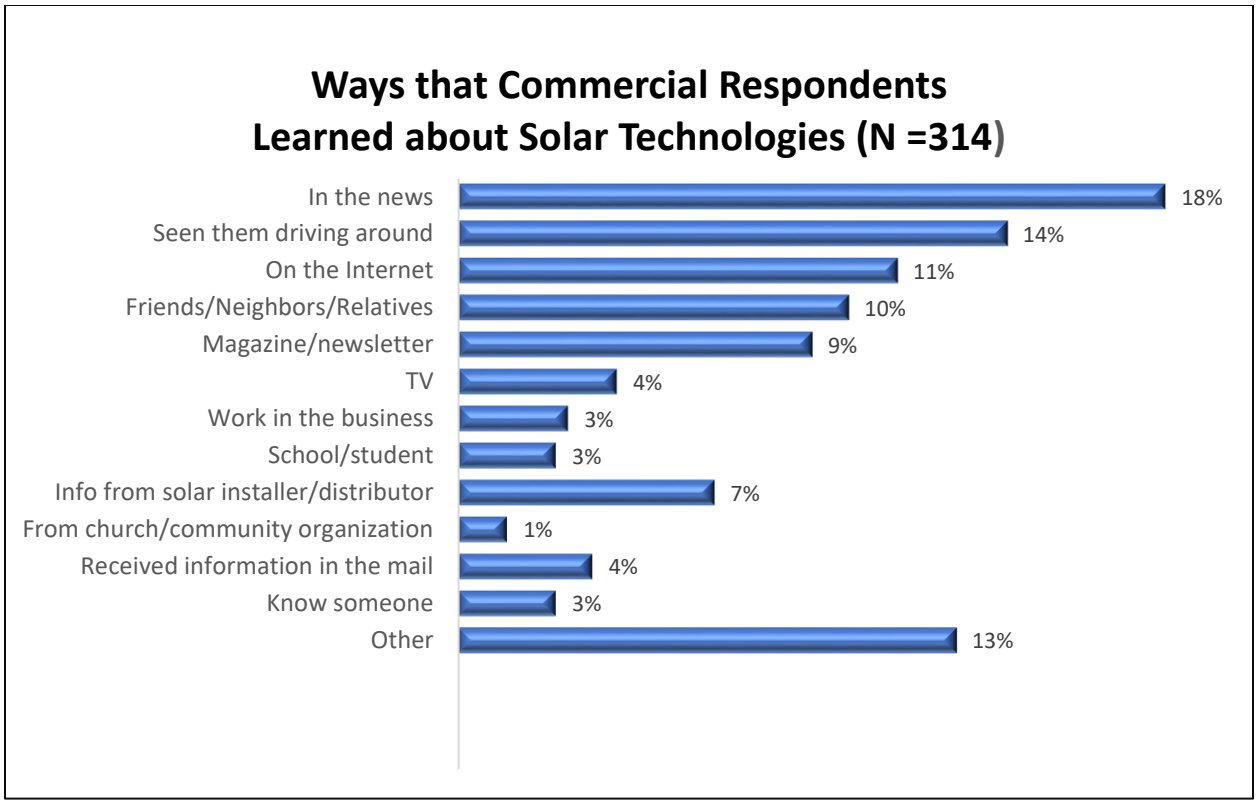

Figure 14: Ways that Commercial Respondents Learned about Solar Technologies

4b. Customer Attitudes Regarding Solar Programs

The commercial customers also answered a similar set of attitudinal questions about community solar using a five-point scale, where "1" meant "Strongly Disagree" and "5" meant "Strongly Agree" with each statement. These findings are summarized next.

4b.1 Attitudinal Questions

These commercial customers expressed the strongest level of agreement in wanting to "learn more" about community solar projects (36%) and agreeing that their employees (34%) and their customers (33%) would approve of their participation in this type of project. These findings suggest that community solar projects would be well-received among these customers.

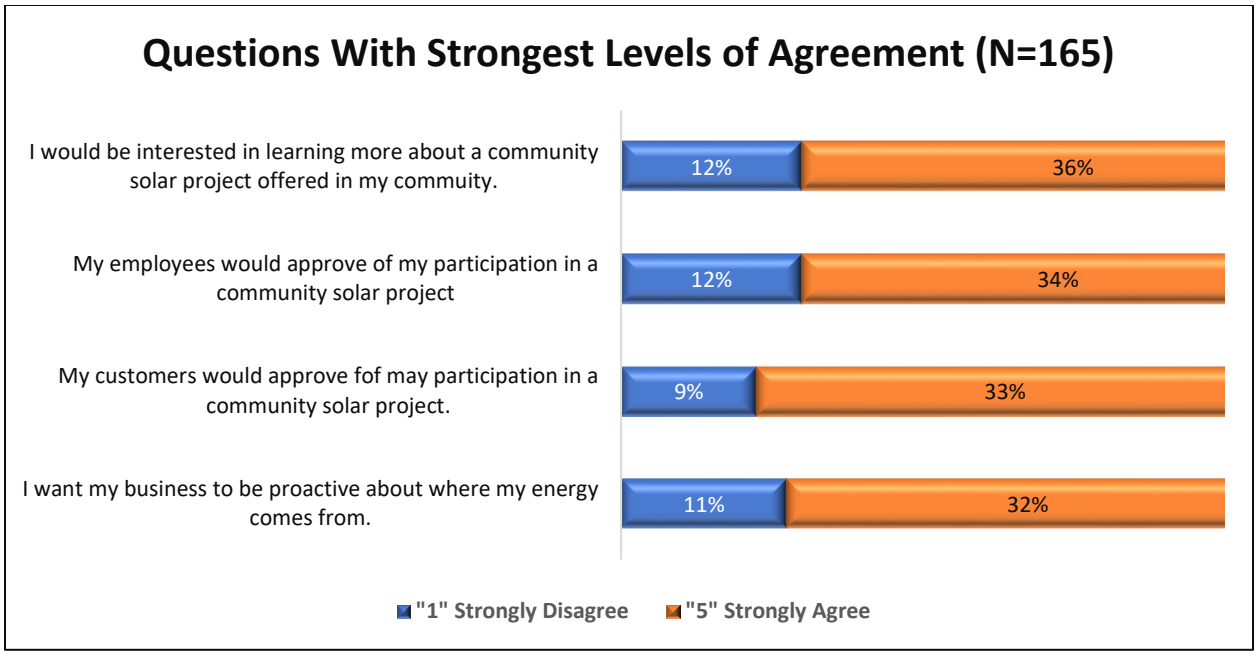

Figure 15: Questions with Strongest Levels of Agreement

Figure 16 illustrates those questions that received the strongest level of disagreement. These questions reinforced the lack of overall awareness of community solar projects with most respondents indicating they had not heard about these types of projects from their customers, utility, friends or neighbors.

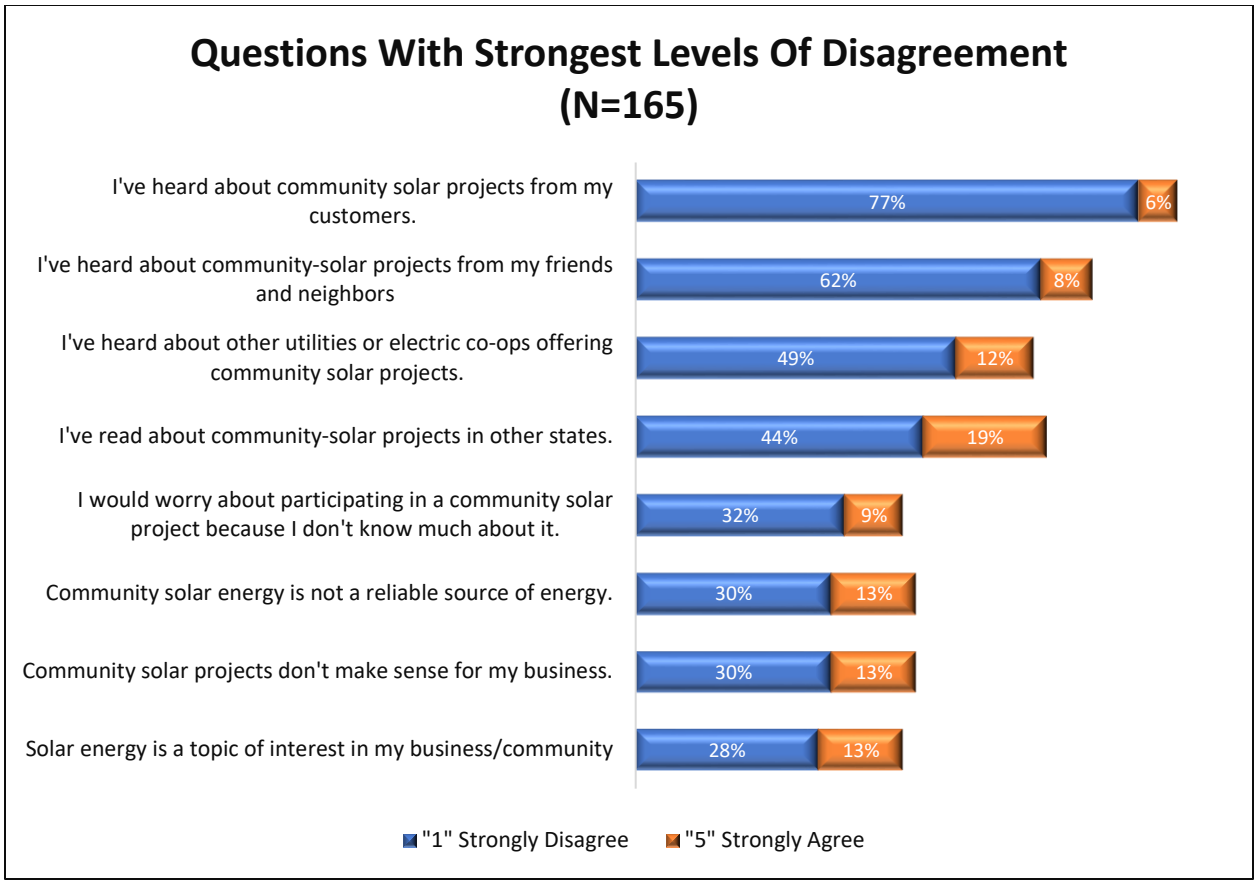

Figure 16: Questions with Strongest Levels of Disagreement

Several statements generated mixed levels of awareness, indicating that commercial customers were divided in their opinions about these topics. As Figure 17 shows, commercial customers were evenly divided (26%) over the statement that *"community solar energy could help slow down climate change"* and a bit more skeptical that *"community solar projects would save their business money"* (19% vs. 17%). These customers were also evenly divided as to whether a community solar project would "save their business money" (17%).

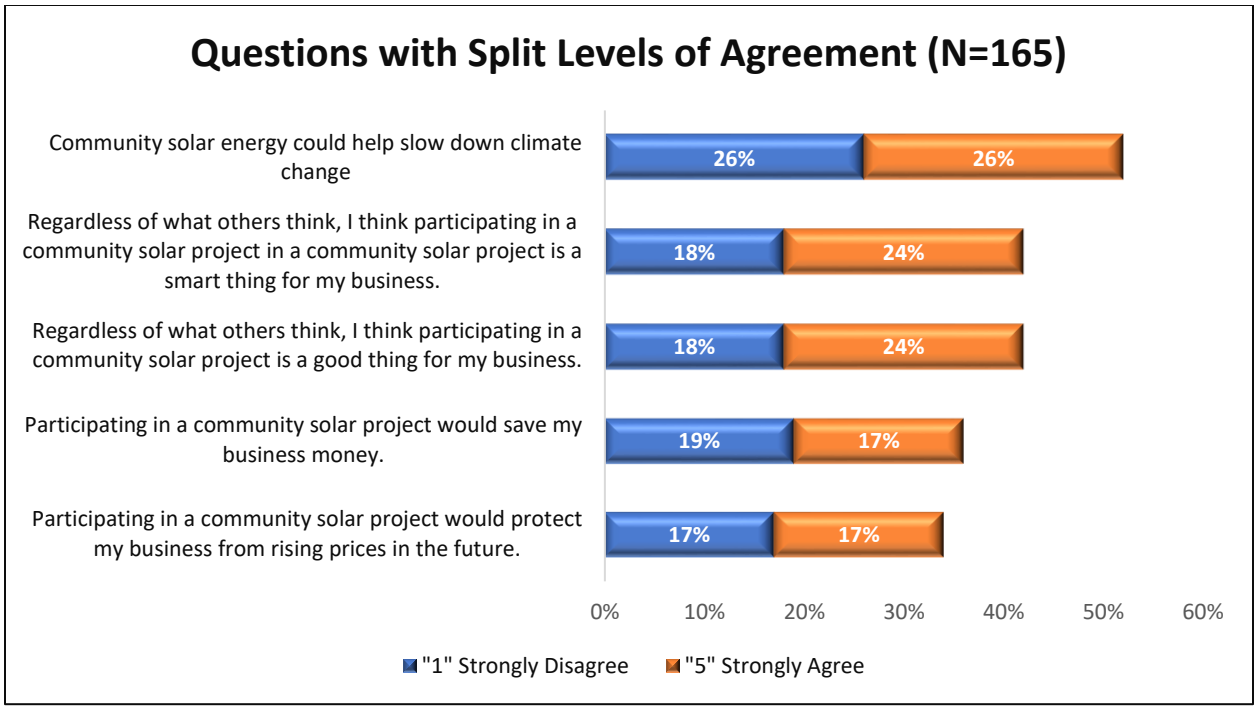

Figure 17: Questions with Spilt Levels of Agreement

The commercial customers appeared to have mixed opinions about community solar projects as the average ratings for these questions were in the "2" to "3" range. There was some level of disagreement regarding the reliability (2.48) and practicality (2.56) of community solar projects, but overall these scores suggest that the respondents' overall unfamiliarity with community solar may be contributing to these lower ratings.

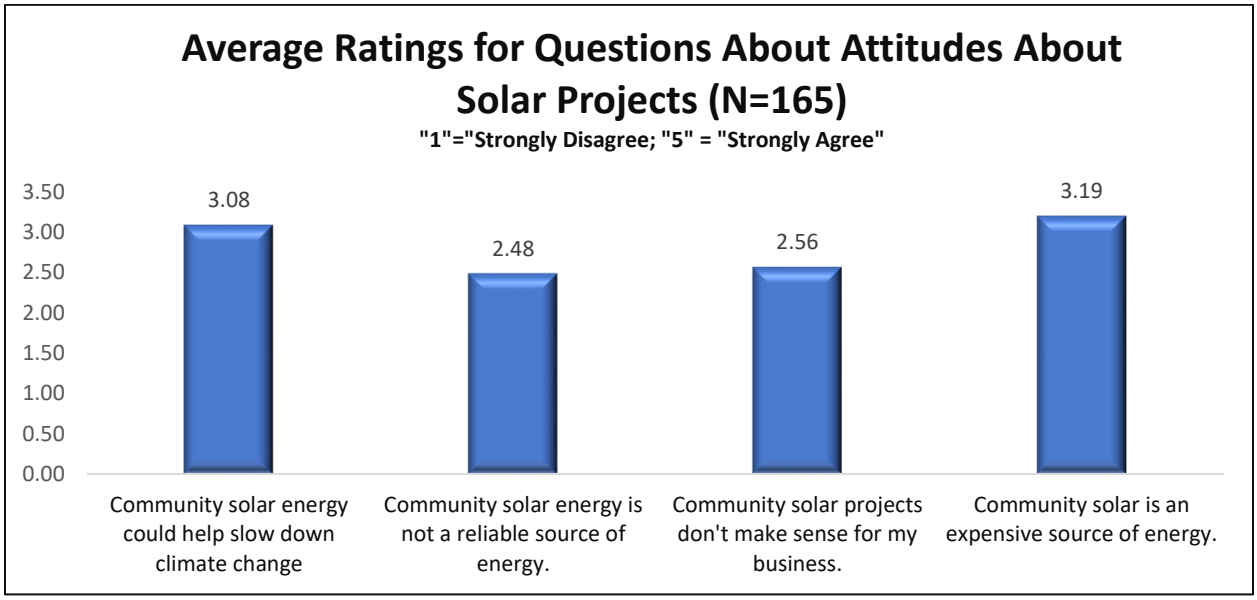

Figure 18: Average Ratings for Questions About Attitudes About Solar Projects

4b.2 Motivational Questions

Commercial customers provided slightly more positive ratings regarding motivational statements, as Figure 19 shows. Overall, these findings suggest that commercial customers are receptive to participating in a community solar project, but are not yet familiar with it.

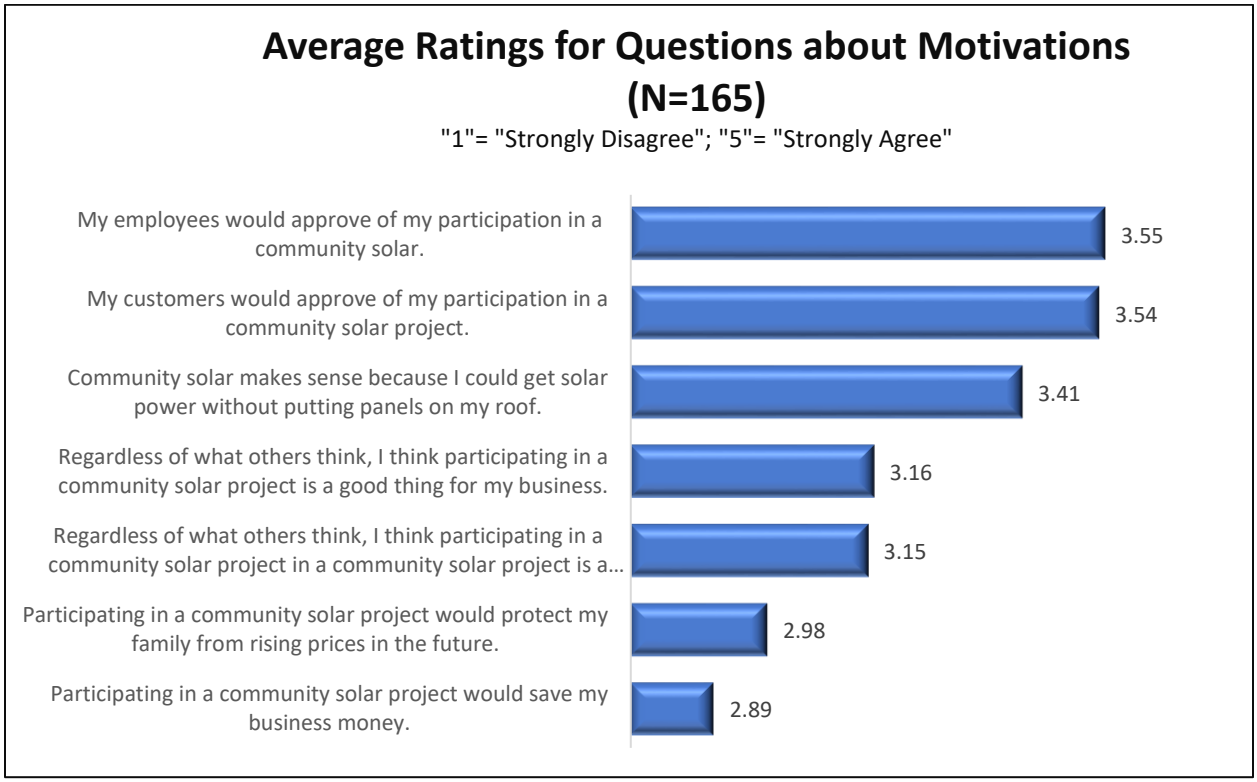

Figure 19: Average Ratings for Motivational Questions Regarding Solar Projects

Examining these findings more closely revealed several interesting trends. Those customers who strongly agreed with the statement "*My customers would approve of my participation in a solar community project"* were also significantly more likely to be willing to pay $40.00 or more to participate in a community solar project.

Those commercial customers who expressed the highest interest in participating in a community solar project were also significantly more likely to "Strongly Agree" with statements:

- "*My company is concerned about climate change"* and "*Community solar energy could help slow down climate change,"*
- "*Participating in a community project is a good way to reduce my environmental impact,"*
- *"I want my business to be proactive about where my energy comes from." "*
- *Regardless of what others think, I think participating in a community solar project is a good thing for my business."* and
- *"Participating in a community solar project is a smart thing to do for my business."*

4b.3 Interest Questions

Commercial customer interest is further reinforced by the customer responses regarding their interest and motivations for participating in a community solar project. For example, customers tended to agree that they wanted to be "proactive" about their energy sources (mean rating of 3.54) and are interested in learning more about community solar projects (mean rating 3.49).

However, like the residential customers, most are not familiar with these projects and have not heard about them from friends or neighbors, leading to the lower overall ratings for these statements.

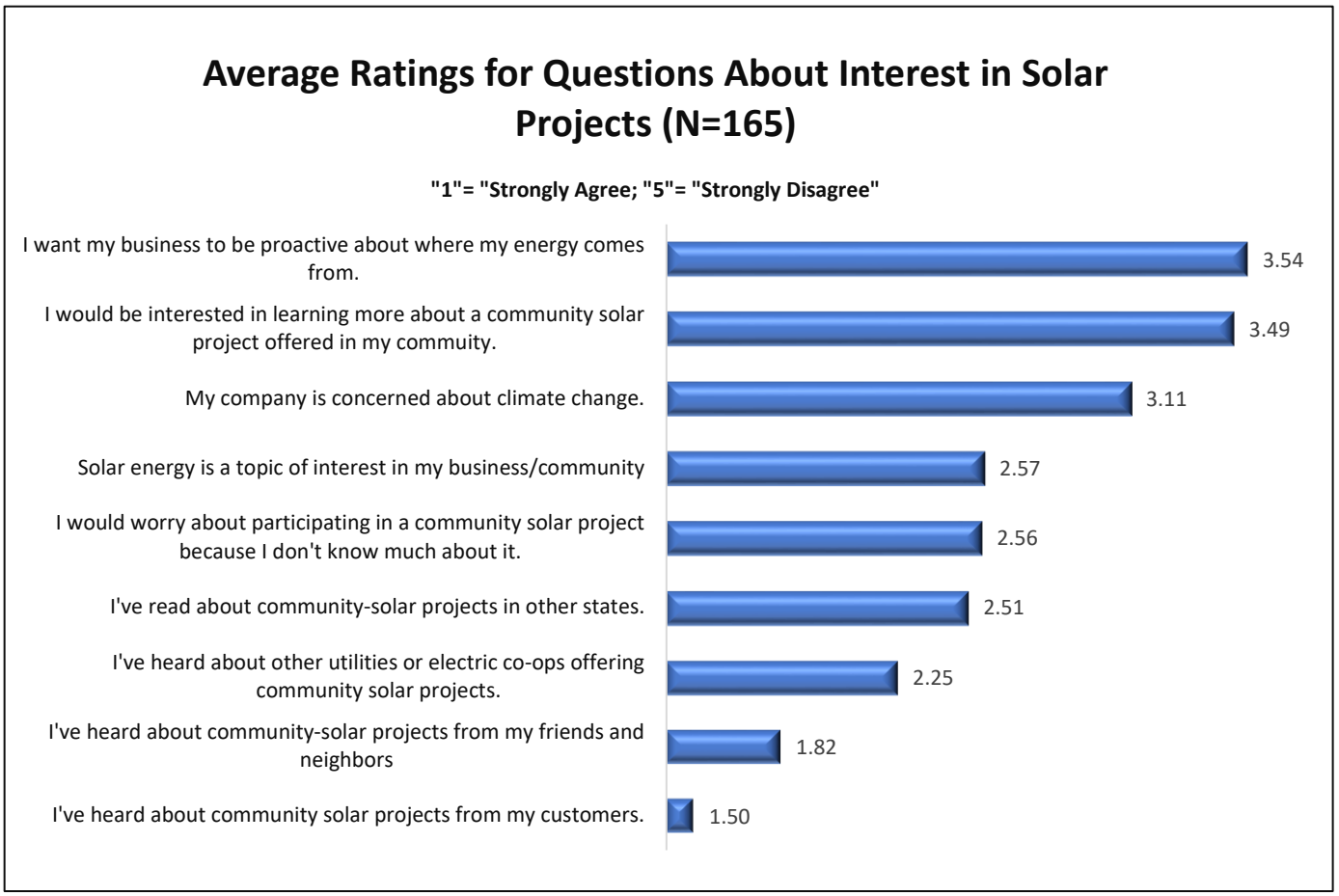

Figure 20: Average Ratings for Questions About Interest in Solar Projects

4c. Location Preferences

Similar to the residential customers, nearly two-thirds (63%) of the commercial customers did not have a preference regarding the location of a community solar project while one-third (36%) did have a locational preference (see Figure 21).

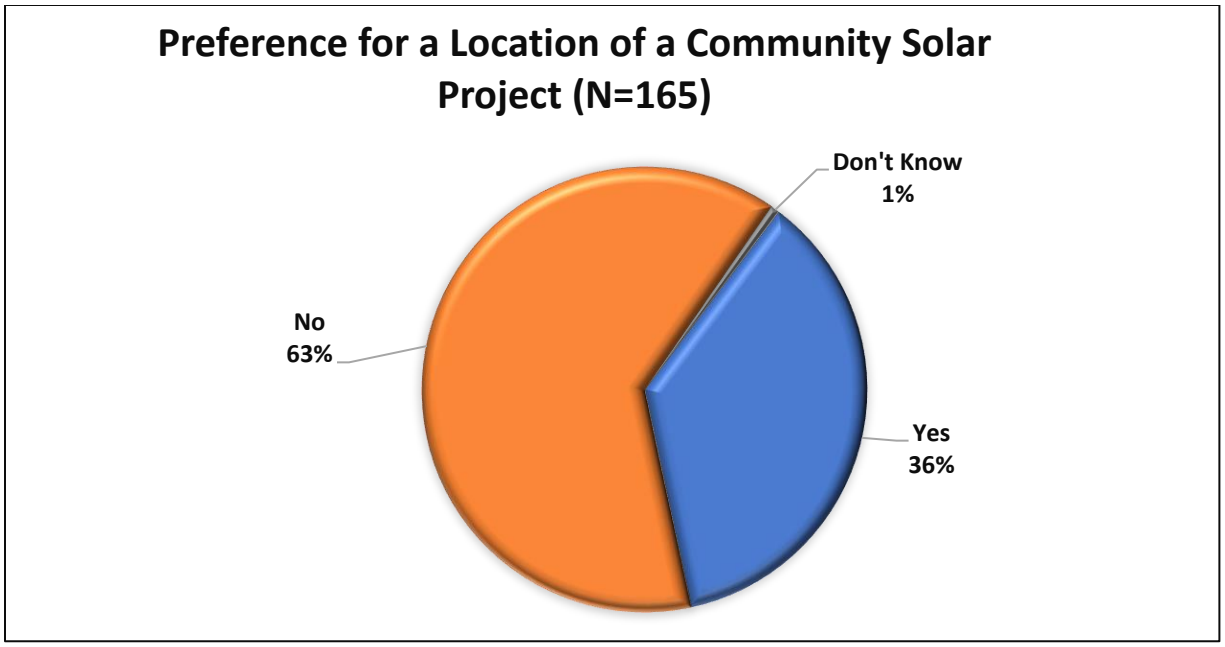

Figure 21: Location Preference Among Commercial Customers

For those 60 customers who indicated a preference for a community solar location, they then rated the strength of this preference using a a five-point scale, where "1" meant "Not at all Important" and "5" meant "Very Important." Overall the survey respondents did not express a strong preference for a specific location, with the slightly higher importance ratings for a community solar project located in Montana (3.87 average rating) or in county where the respondent lives (3.69 average rating) see Figure 22).

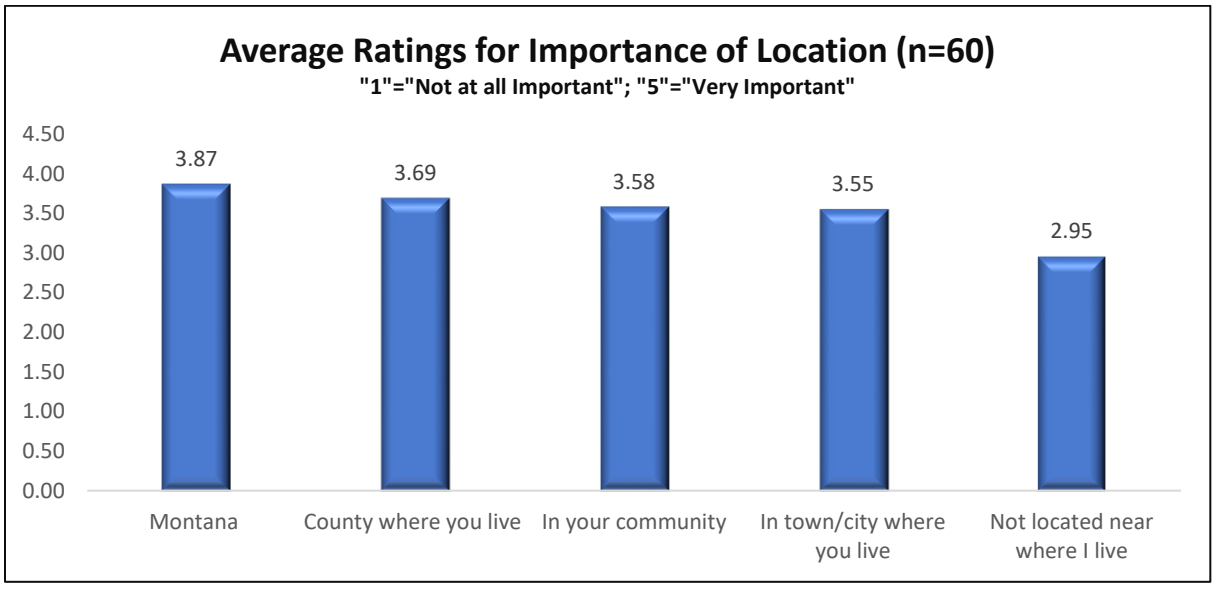

Figure 22: Average Ratings for Importance of Location

Of interest, NorthWestern Energy customers were significantly more likely to rate this as "5" compared to MDU customers regarding wanting the solar project located in Montana. Figure 23 compares the differences in the preferences among these commercial customers.

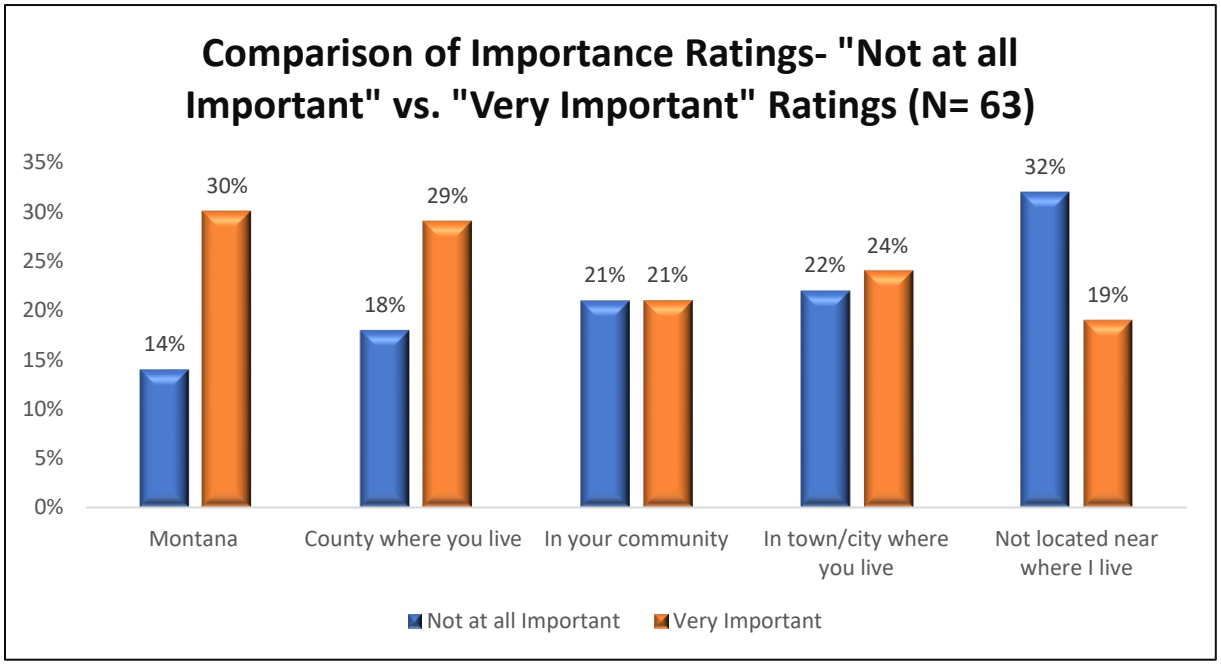

Figure 23: Comparison of Importance Ratings for Location Preferences- Commercial Customers

4d. Solar PV Ownership

Only six commercial customers owned a solar PV system. The six owners installed these systems for three major reasons: to provide power in a remote location (n=1); to use alternative energy (N=3). Of note, two respondents expected the solar PV systems to be cheaper than they were. These systems were installed in 2014 or later.

However, the majority of commercial customers had not considered purchasing a solar PV system (79%) while slightly less than a quarter (21%) have considered purchasing a solar PV system.

A total of 34 customers provided 42 reasons for not purchasing a solar PV system. The most frequently mentioned barriers to purchasing a solar PV were the expense (45%) and the hassle (12%) of installing a system (see Table 14).

Table 14: Reasons for Not Purchasing a Solar PV System*

Reasons for Not Purchasing a Solar PV System	Total Mentions	% of Total
Too expensive	19	45%
Can't be bothered	5	12%
Rent our facilities	4	10%
Don't know enough to make a decision	3	7%
Hard to find someone capable to install it	3	7%
Too little sun/snow/too cold	2	5%
Tax credits went away	2	5%
Don't like them	1	2%
Financing isn't available at rate I can afford	1	2%
My business isn't interested in making that type of investment.	1	2%
Not reliable	1	2%
Total Answers	**42**	**100%**

*Multiple Response Question

4e. Participation in a Community Solar Project

Although the majority of commercial customers are not interested in purchasing their own solar PV system, they are interested in participating in a community solar project. As Figure 24 shows, nearly two-thirds (62%) are interested while 31 percent are not. Of note, seven percent did not have an opinion.

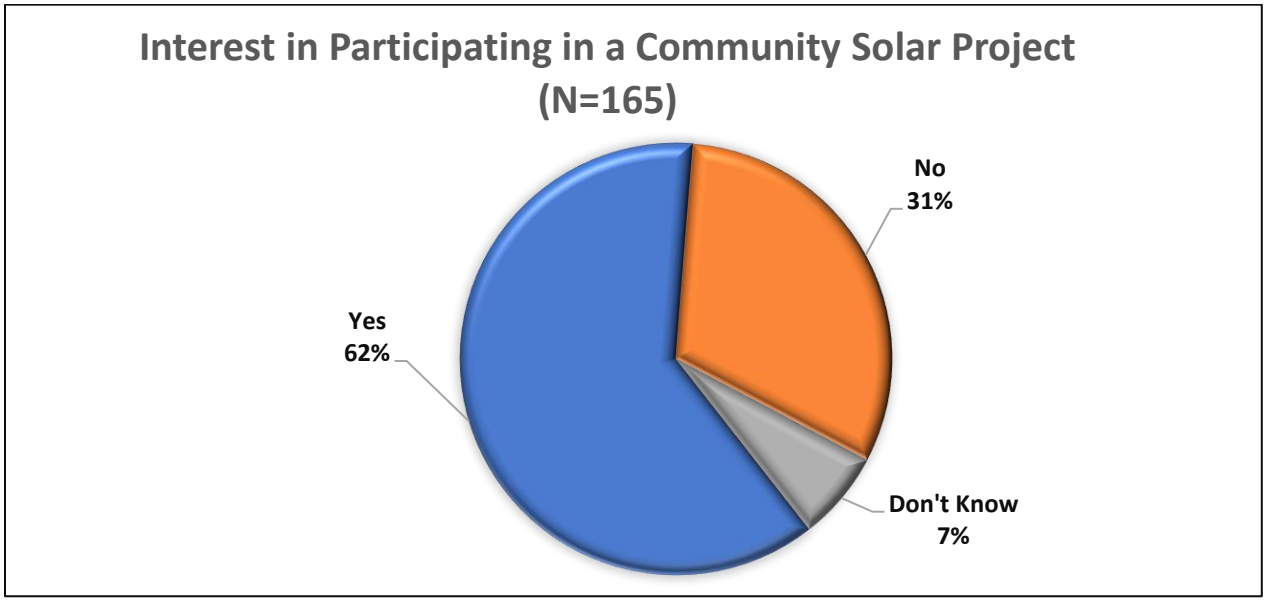

Figure 24: Interest in Participating in a Community Solar Project- Commercial Customers

Most commercial customers also expected that participation in a community solar program would lower their electric bill (59%) compared to 18 percent who expected their electric bill to stay the same or increase as a result of participation in this type of project (see Table 15.)

Table 15: Participant Expectations Regarding Electric Bill

Expect participation to	Number	% of Total	Estimated Average Amount Monthly Bill Would Change
Lower your electric bill	98	59%	$94.19 decease
Increase your electric bill	30	18%	$69.17 increase
Not change your electric bill	30	18%	
Don't know/Refused	7	4%	
Total	**165**	**99%**	

As Table 15 shows, the customers also provided estimates about how much their monthly electric bill would change. For those respondents who expected a decrease in their monthly bill, the average amount they expected was nearly $100.00. Among respondents who forecasted that participating in a community solar project would increase their bill, they expected their monthly electric bill to increase by nearly $70.00.

4e.1. Willingness to Pay

More than one-half of these commercial customers (53%) would be willing to pay a monthly charge of $40.00 or more to participate in a community solar project (see Table 17).

Table 16: Summary of Willingness to Pay Ranges Among Commercial Customers

Ranges of Willingness to Pay	Number Reporting	% of Total
Less than $10.00	25	15%
$10.00-$19.99	14	9%
$20.00-29.99	19	12%
$30.00-$39.99	6	4%
$40.00-$49.99	14	8%
$50.00 or above	69	42%
Don’t know	18	11%
Total	**165**	**100%**

Given their relatively low levels of awareness of solar technologies overall, it is not surprising that most commercial customers were also unfamiliar with most types of solar financing options. These levels of familiarity, summarized in Figure 25, illustrates this finding.

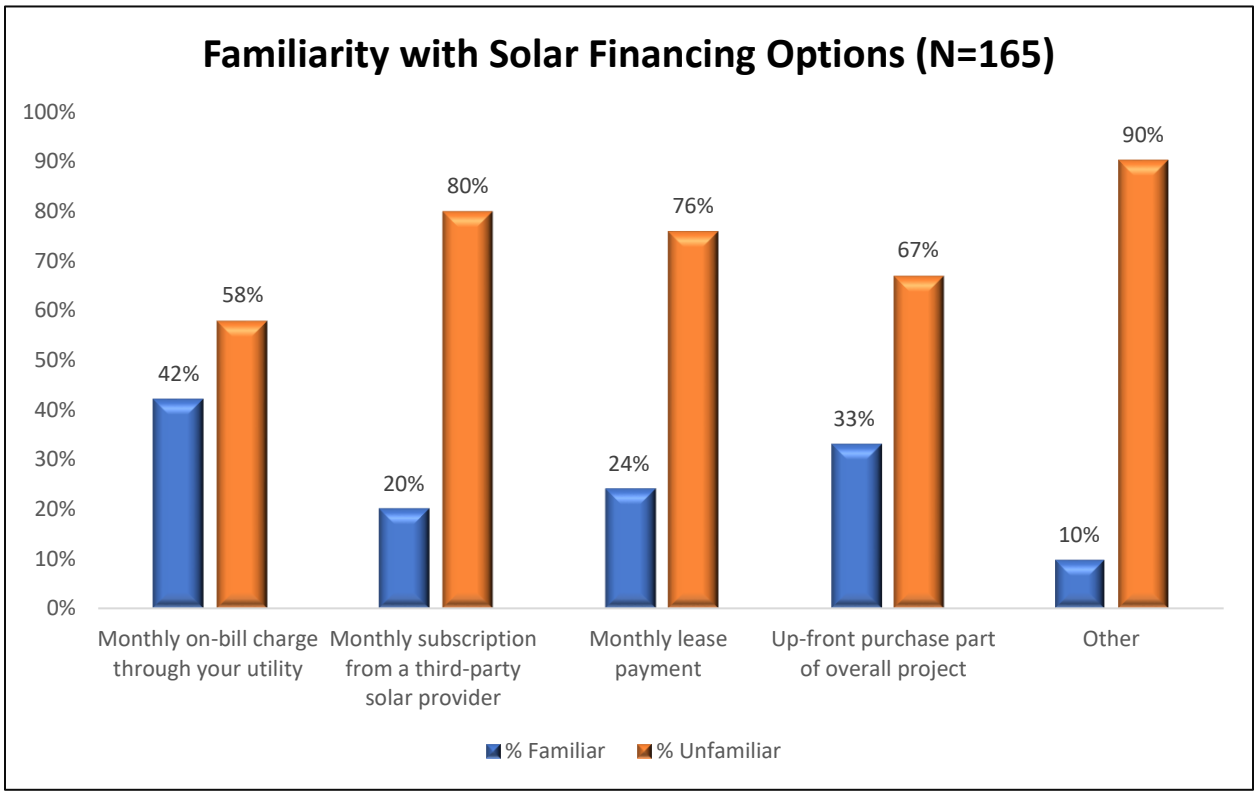

Figure 25: Familiarity with Solar Financing Options- Commercial Customers

Commercial customers expressed a relatively low level of interest in finding out more about solar financing options (see Table 17). About one-quarter of these respondents are interested in various financing options, with monthly on-bill charges from the utility option mentioned by 29 percent of these respondents.

Table 17: Summary of Interest in Solar Financing Options*

Which option would you like to find out more about?	Number mentioning	% Mentioned
Monthly on-bill charge through your utility	78	29%
Up-front purchase as part of the overall community solar project	64	24%
Monthly subscription fee from a third-party provider	59	22%
Monthly lease payment	55	20%
None- I don't want to do solar	8	3%
Other	5	2%
Total	**269**	**100%**

*Multiple Response Question

Overall, 47 percent of the respondents wanted to learn more about the monthly on-bill charge from a utility, while 40 percent of these customers, overall, wanted to learn about up-front purchase as a part of an overall community solar project.

4f.Company Demographics (Firmographics)

The commercial survey respondents were nearly evenly divided between customers from NorthWestern Energy (51%) and Montana Dakota Utilities (49%). Most of these respondents were from professional services companies (32%) followed by small commercial firms (24%) as illustrated in the following figure.

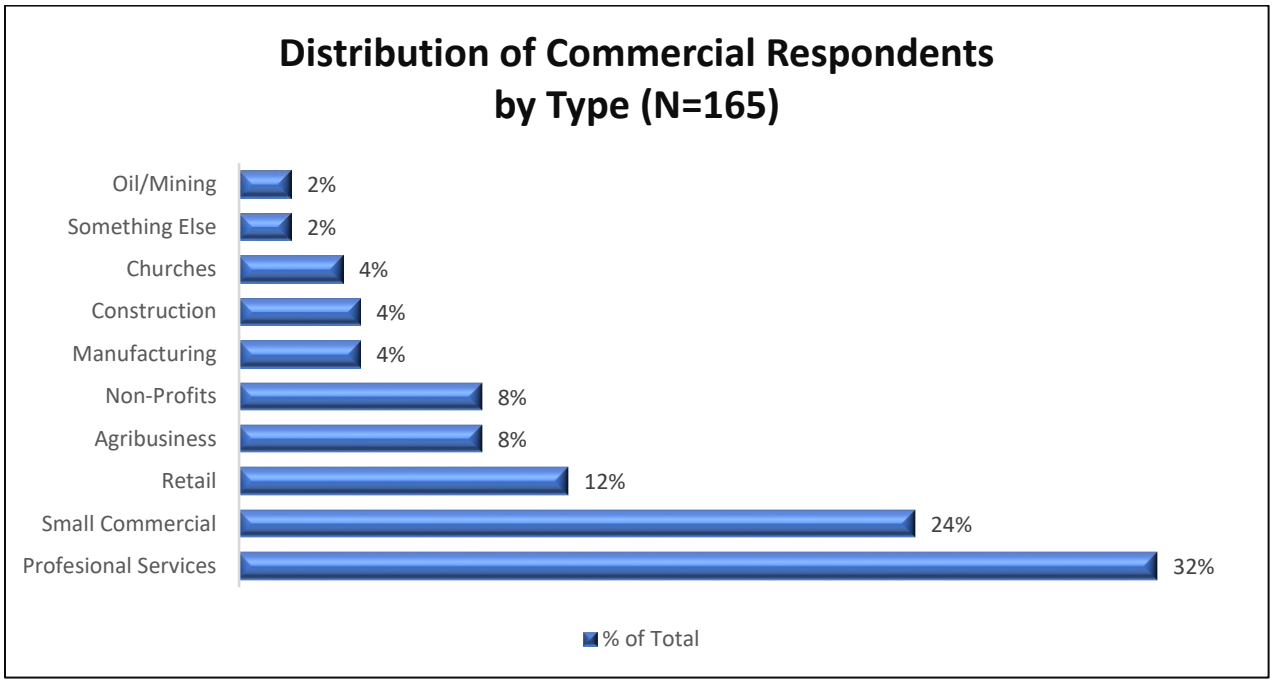

Figure 26: Distribution of Commercial Respondents by Type

Eighty percent of these commercial customers had one office location while the remainder (20%) had two or more locations.

Most commercial respondents also had small businesses of with 10 or less employees (81%).

Table 18: Number of Employees Among Commercial Respondents

Number of Employees	Number	% of Total
10 or less	133	81%
11-25	23	14%
26-50	4	2%
51-100	5	3%
Total	**165**	**100%**

5. Key Findings and Recommendations

Key Findings

These customer surveys identified several key findings that will be important for the Montana DEQ and Montana utilities to consider in developing community solar project offerings. These key findings are:

- *While customers may not be familiar with solar PV technologies, they are interested in participating in a community solar project.* Specifically, the residential survey revealed that those customers who are most interested participating in a community solar project are NorthWestern Energy customers, those customers who live in multifamily homes and those with a graduate degree.
- *The survey also revealed several significant differences within residential customers regarding their attitudes about energy and environmental concerns*. Statements that generated the strongest levels of agreement included those that focused on reducing the environmental impact, and protecting their families from rising energy prices. Of particular interest, customers who agreed most strongly with these statements tended to be:
    - Significantly more interested in a community solar project;
    - Were willing to pay more than $40.00 per month to participate in a solar energy project; and
    - Did not indicate a preference for the location of a community solar project.
- Customers who had the strongest levels of disagreement with these statements were significantly more likely to be:
    - MDU customers; and
    - Customers who were willing to pay less than $40.00 per month to participate in a community solar project.
- *There were no significant differences among the commercial customers to identify any particular target groups.* Overall, these customers are interested in participating in a community solar project; however, they are unfamiliar with specific details about these projects.
- *Climate change remains an area of disagreement among both residential and commercial customers.* Statements regarding the impact of climate change resulted in nearly even divisions of opinions among both residential and commercial customers.
- *The high up-front cost of solar* PV remains the largest barrier mentioned by non-solar PV owners. Furthermore, customers who did not currently own solar PV systems did not believe that this type of investment was either practical or feasible for their current home or business.

- *Overall, the survey respondents expected that participation in a community solar project would reduce their bills substantially.* On average, residential customers estimated that participation in a community solar project would lower their monthly bill by as much as $53.46 while commercial customers projected an even higher savings of $94.19.

Key Recommendations

The following recommendations are based on the customer survey findings.

- *Community solar projects would require significant levels of residential and commercial education to convince customers to participate.* Furthermore, community solar project would require significant customer education to allay concerns about the reliability and practicality of community solar project.
- *Community solar projects could be located within the state of Montana,* as none of the customer groups expressed a strong interest in having a community solar project located within their community.
- *Community solar projects would be favorably received among both commercial and residential customers.* However, customer expectations regarding anticipated monthly savings should be clarified to minimize any potential customer confusion or negative feedback.